

LISTING OF THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A sternal closure system configured for reapproximating left and right halves of a patient's longitudinally incised sternum during a surgical procedure in the thoracic cavity, the system comprising:

a first, at least one anchor ~~means~~ having an inner axial passage, configured adapted to be disposed inside the left half of the sternum;

a second, at least one anchor ~~means~~ having an inner axial passage, configured adapted to be disposed inside the right half of the sternum; and

at least one rigid fixing element means made of a metallic material, said fixing element comprising a staple defined by a body portion and by two legs extending orthogonally from the body portion, said legs being having two legs, each configured adapted for insertion in a respective one of said axial passages of said first and second anchors so as upon insertion, to rigidly connect said first, at least one anchor means, disposed within the left half of the sternum, to said second, at least one anchor means disposed within the right half of the sternum, the body portion of the rigid fixing means element configured adapted to externally extend across an incision of the incised sternum between first and second anchors means with said legs of the rigid fixing element and being removably tightly held within the respective axial passages of by the first and second anchors means as a non-attached member separate from the first and second anchor means, the rigid fixing means element configured adapted to maintain the left half of the sternum and the right half of the sternum in relative position for reapproximation, and

a fixing apparatus configured for simultaneous linear displacement of the first and second anchors in a direction across the incision of the incised sternum so as to bring the first and second anchors closer together and thus to reapproximate the left half of the incised sternum and the right half of the incised sternum, said fixing apparatus configured to be capable of securing the first and second anchors in their relative positions upon reapproximation of the left and right halves of the incised sternum and said fixing apparatus is configured to removably insert the legs of said rigid fixing element into respective longitudinal passages of said first and second anchors upon bringing the first and second anchors together,

the legs of said rigid fixing ~~means~~ element being configured ~~adapted~~ for subsequent extraction from the respective axial passages so as to facilitate separation of the left and right halves of the sternum when necessary, and for re-insertion of the fixing element therein.

2. (Currently Amended) A system according to claim 1, wherein said first, at least one anchor ~~means~~, configured ~~adapted~~ to be disposed within the left half of the sternum, and said second, at least one anchor ~~means~~, configured ~~adapted~~ to be disposed within the right half of the sternum, are screws having an external thread of one direction.

3. (Currently Amended) A system according to claim 1, wherein said first, at least one anchor ~~means~~, configured ~~adapted~~ to be disposed within the left half of the sternum, and said second, at least one anchor ~~means~~, configured ~~adapted~~ to be disposed within the right half of the sternum, are screws having an external thread of different directions.

4. (Currently Amended) A system according to claim 1, wherein said first, at least one anchor ~~means~~, configured ~~adapted~~ to be disposed within the left half of the sternum, and said second, at least one anchor ~~means~~, configured ~~adapted~~ to be disposed within the right half of the sternum, have heads provided with ~~means~~ elements for grasping and rotating them by said apparatus for simultaneous placing of said anchors ~~means~~.

5. (Currently Amended) A system according to claim 4, wherein the heads of said first and said second anchors ~~means~~ are provided with elements ~~means~~ for their grasping by said apparatus for simultaneously placing said anchors ~~means~~, said grasping elements ~~means~~ being generally shaped as grooves on the side surface of said heads.

6. (Currently Amended) A system according to claim 4, wherein the heads of said first and said second anchors ~~means~~ are provided with elements ~~means~~ for their rotation by said apparatus for simultaneously placing said anchors ~~means~~, and these ~~means~~ elements for their rotation are generally cross-shaped slots on the end surface of said heads.

7. **(Original)** A system according to claim 4, wherein the heads of said first and said second anchors ~~means~~ are provided with elements ~~means~~ for their rotation by said apparatus for simultaneous placing of said anchors ~~means~~, and these ~~means~~ elements for rotation are substantially shaped as hexahedral holes in the end face of said heads.

8. **(Currently Amended)** A system according to claim 1, wherein said at least one fixing element ~~means~~ is substantially shaped as a staple having a body and at least two legs extending from the body in a substantially perpendicular relationship, whereby said staple is configured ~~adapted~~ for rigidly connecting said first, at least one anchor ~~means~~, to said second, at least one anchor ~~means~~.

9. **(Canceled)**

10. **(Currently Amended)** A system according to claim 8, wherein said at least one fixing element ~~means~~ is formed as a staple having a curved body and at least two slightly curved legs for tightly disposing in a respective inner axial passage of said first, at least one anchor ~~means~~ configured ~~adapted~~ to be disposed in the left half of the sternum, and said second, at least one anchor ~~means~~ configured ~~adapted~~ to be disposed in the right half of the sternum.

11. **(Currently Amended)** A system according to claim 1, wherein said first, at least one anchor ~~means~~, configured ~~adapted~~ to be disposed within the left half of the sternum, said second, at least one anchor ~~means~~, configured ~~adapted~~ to be disposed within the right half of the sternum, and said at least one fixing ~~means~~, are all made of FDA approved metal or alloy, mainly of one of metal or alloy of the group, consisting of stainless steel, titanium, tantalum, alloys of titanium and tantalum.

12. **(Currently Amended)** A system according to claim 1, wherein said first, at least one anchor ~~means~~, configured ~~adapted~~ to be disposed within the left half of the sternum, said second, at least one anchor ~~means~~, configured ~~adapted~~ to be disposed within the right half of

the sternum, and said at least one fixing ~~means~~, are all ~~made from~~ comprised of FDA approved biodegradable material.

13. (Currently Amended) A system according to claim 1, further comprising an apparatus for simultaneously placing in the sternum first, at least one anchor ~~means~~, configured adapted to be disposed within the left half of the sternum and said second, at least one anchor ~~means~~ configured adapted to be disposed within the right half of the sternum, said apparatus comprising:

a power element ~~means~~ to generate a torque;

an element ~~means~~ for transmitting torque simultaneously to said first and said second anchors ~~means~~;

an element ~~means~~ for searching and grasping simultaneously said first and said second anchors ~~means~~; and

an element ~~means~~ for retaining and simultaneously delivering said first and said second anchors ~~means~~ to said element ~~means~~ for their searching and grasping.

14. (Currently Amended) A system according to claim 13, wherein said power element ~~means~~ for generating a torque comprises one of the members ~~means~~ of a group ~~including~~ consisting of an electric, pneumatic ~~or~~ and hydraulic engine.

15. (Currently Amended) A system according to claim 13, wherein said element ~~means~~ for transmitting torque simultaneously to said first and said second anchors ~~means~~ is generally comprises a gear box having one drive shaft and at least two driven shafts.

16. (Currently Amended) A system according to claim 15, wherein on the driven shafts of said gear box there are mounted spring-loaded heads forming said ~~means~~ element for searching and grasping simultaneously said first and said second anchors ~~means~~.

17. (Currently Amended) A system according to claim 13, wherein said apparatus for simultaneously placing in the sternum said first, at least one anchor ~~means~~, configured

adapted to be disposed within the left half of the sternum, and said second, at least one anchor means, configured adapted to be disposed within the right half of the sternum, comprises a frame element means with vertical guides, and said means element for retaining and simultaneously delivering said first and said second anchors means to said means element for their searching and grasping comprises a spring-loaded cartridge means disposed within said frame element means.

18. (Currently Amended) A system according to claim 17 wherein, said element means for retaining and simultaneously delivering said first and said second anchors means to said means element for their searching and grasping comprises a spring-loaded cartridge means, disposed within said frame element means and capable of stepping horizontal movement towards said means element for searching and grasping said anchors means.

19. (Currently Amended) A system according to claim 13, wherein said apparatus for simultaneously placing in the sternum said first, at least one anchor means configured adapted to be disposed within the left half of the sternum, and said second, at least one anchor means configured adapted to be disposed within the right half of the sternum, contains a frame element means with two horizontal plates disposed in a parallel relationship to each other and at least one vertical guide rigidly connected to at least one of these plates, and said means element for retaining and simultaneously delivering said first and said second anchors means to said means element for their searching and grasping contains two spring-loaded rotary drums disposed between the plates within said frame element means.

20. (Currently Amended) A system according to claim 19, wherein said means element for retaining and simultaneously delivering said first and said second anchors means to said means element for their searching and grasping contains two spring-loaded rotary drums disposed between the plates within said frame element means configured adapted to perform stepping synchronous swinging about their vertical axes towards said means element for searching and grasping said anchors means.

21. (Currently Amended) A system according to claim 13, wherein, in said apparatus for simultaneously placing in the sternum said first, at least one anchor ~~means~~, configured adapted to be disposed within the left half of sternum, and said second, at least one anchor ~~means~~, configured adapted to be disposed within the right half of sternum, said power ~~means~~ element generating torque, ~~means for~~ transmitting torque simultaneously to said first and said second anchors ~~means~~, and ~~means~~ element for searching and grasping simultaneously said first and said second anchor ~~means~~, are formed as a single unit disposed on said at least one vertical guide of said frame ~~means~~ element reciprocally relative to the latter.

22. (Currently Amended) A system according to claim 1, ~~further comprising a fixing apparatus for placing and removing said fixing means adapted for rigidly securing to one another said first, at least one anchor means, adapted to be disposed within the left half of the sternum and said second, at least one anchor means, adapted to be disposed within the right half of the sternum, wherein in which~~ the fixing apparatus comprises:

at least first and second levers each having a proximal end and distal end, the levers being pivotally connected to one another and provided with handles at their distal ends and ~~means~~ with element for grasping heads of anchors ~~means~~ at their proximal ends, the arrangement being such that upon relative pivoting of either the first or the second lever, said grasping heads are simultaneously linearly displaceable and can be brought closer together;

at least one third lever pivotally connected to said first lever or said second lever and provided with a handle at its distal end, and at its proximal end with an ~~means~~ element for delivering the legs of the rigid fixing means element inside respective longitudinal passages of said first and said second anchors ~~means~~, said third lever being formed substantially as a pusher;

an means element for retaining and by the piece delivering of rigid fixing means, elements, formed substantially as a movable spring-loaded die with slots for disposing rigid fixing elements means.

23. (Currently Amended) A system according to claim 22, wherein said fixing apparatus further comprises at least first and second levers each having a proximal end and a distal end, the first and second levers being pivotally connected to each other, spring-loaded

relative to each another and provided with handles at their distal ends, and ~~means~~ an element for grasping the heads of anchors ~~means~~ at their proximal ends.

24. (Currently Amended) A system according to claim 22, wherein said ~~means~~ elements for grasping the heads of anchors ~~means~~ are formed as two protrusions facing one another, one of them being disposed at the proximal end of first lever, and the second at the proximal end of second lever, and these protrusions have, at their free ends, recesses matching a shape of grooves on side surfaces of heads of said anchors ~~means~~.

25. (Currently Amended) A system according to claim 22, wherein said fixing apparatus further comprises at least one third lever pivotally connected to said first lever or said second lever and spring-loaded relative to the first or second levers, said third lever being provided with a handle at its distal end, and at its proximal end with an means element for delivering the fixing ~~means~~ inside said first and said second anchors ~~means~~, which is shaped substantially as a pusher.

26. (Currently Amended) A system according to claim 22, wherein said fixing apparatus has an means element for retaining and by the piece delivering of fixing elements ~~means~~, comprising generally a movable spring-loaded die with slots for disposing the fixing element ~~means~~, the die being configured ~~adapted~~ to perform stepping linear movement in a guide, which is rigidly connected to said first lever or to said second lever of said fixing apparatus.

27. (Currently Amended) A system according to claim 1, further comprising a fixing apparatus for placing said fixing elements ~~means~~, the fixing apparatus comprising:
at least two levers, the first and the second, each of them having a proximal end and a distal end, the at least two levers being pivotally connected to one another and provided with handles at their distal ends, as well as with ~~means~~ an element for grasping heads of anchors ~~means~~ at their proximal ends;

at least one third lever pivotally connected to a bearing plate rigidly secured on said first lever or said second lever, the third lever having a handle at its free end, and pivotally connected by its middle to the means element for delivering the fixing means elements inside first and said second anchors means formed substantially as a pusher;

an means element for retaining and by the piece delivering of fixing means elements formed substantially as a cartridge enclosing spring-loaded fixing means element located right up to one another.

28. (Currently Amended) A system according to claim 27, wherein said fixing apparatus contains at least two levers, the first and the second, each of them having a proximal end and a distal end, these levers are pivotally connected to one another and provided with handles at their distal ends, means an element for mutually fixing the handles when brought together, as well as by means elements for grasping the heads of anchors means at their proximal ends.

29. (Currently Amended) A system according to claim 28, wherein said elements means for grasping the heads of anchors means are configured as two protrusions facing one another, one of which is disposed at the proximal end of the first lever, and the second at the proximal end of the second lever, and the protrusions having at their free ends recesses matching a shape of grooves on side surfaces of the heads of said anchors means.

30. (Currently Amended) A system according to claim 27, wherein said fixing apparatus contains a single unit including at least one third lever, an means element for retaining and by the piece delivery of fixing means elements formed substantially as a cartridge, and an means element for delivering a fixing means element inside said first and said second anchors means formed substantially as a pusher, this single unit is pivotally connected to the bearing plate rigidly mounted on said first lever or said second lever and is capable of folding back in the vertical plane to provide viewing of said means element for grasping the anchors means or returning into operative position with simultaneous rigid fixing of the cartridge at the proximal ends of said first and second levers of the fixing apparatus.

31. (Currently Amended) A system according to claim 1, further comprising an apparatus for removing said fixing elements ~~means~~ when it is necessary to perform a post-operative surgical procedure within the thoracic cavity, the apparatus for removing comprising:
a hollow body provided with a handle extending therefrom, and in its lower part, a bifurcated stop;
a spring-loaded grasping member movably disposed within the hollow body; and
a pressure lever pivotally mounted on a pin within the upper part of the hollow body, the pressure lever having a handle extending substantially in the same direction as said handle of the hollow body and a free end located within the hollow body and operatively connected to said spring-loaded grasping member.

32. (Canceled)

33. (Currently Amended) A system according to claim 1, further comprising an apparatus for simultaneously placing in the sternum said first, at least one anchor ~~means~~, configured ~~adapted~~ for disposing within the left half of the sternum, and said second, at least one anchor ~~means~~, configured ~~adapted~~ to be disposed within the right half of the sternum.

34. (Currently Amended) A system according to claim 1, further comprising a fixing apparatus for placing said fixing ~~means~~ elements ~~configured~~ ~~adapted~~ for rigidly and releasably connecting said first, at least one anchor ~~means~~, configured ~~adapted~~ to be disposed within the left half of the sternum and said second, at least one anchor ~~means~~, configured ~~adapted~~ to be disposed within the right half of the sternum, whereby there is performed a rigid connection to one another of the left and the right halves of the sternum during a surgical procedure within the thoracic cavity.

35. (Currently Amended) A system according to claim 1, further comprising an apparatus for removing said fixing ~~means~~ elements when it is necessary to perform a post-operative surgical procedure in the thoracic cavity, facilitating separation of the left and right halves of sternum closed in this way, in case of post-operative emergency surgical procedures.

36. (Currently Amended) A sternal closure system for maintaining left and right halves of a patient's longitudinally incised sternum in proper spaced relationship during a surgical procedure in the thoracic cavity, the system comprising:

a first anchor having an inner axial passage, configured adapted to be disposed within the left half of the sternum;

a second anchor having an inner axial passage, configured adapted to be disposed within the right half of the sternum; and

a rigid fastener made of a metallic material and defined by a body portion having two legs each being configured adapted for repeated insertion into and withdrawal from a respective one of said inner axial passages when the first anchor and the second anchor are disposed within respective halves of the sternum, the body portion of the rigid fastener configured adapted to externally extend across an incision of the incised sternum between the first anchor and second anchor ~~and being~~ while said legs are removably tightly held as a non-attached member separate from the first anchor and second anchor within the inner axial passages, the rigid fastener configured adapted to maintain the left half of the sternum and the right half of the sternum in relative position ~~[[for]]~~ upon reapproximation; and

a fixing apparatus adapted for simultaneous linear displacement of the first and second anchor means so as to bring the first and second anchor means closer together and thus to reapproximate the left half of the sternum and the right half of the incised sternum, said fixing apparatus being capable to secure the first and second anchor means in their relative position upon reapproximation of the left and right half of the incised sternum and said fixed apparatus is adapted to removably insert the legs of said rigid fixing means into respective longitudinal passages of said first and second anchor means upon bringing the first and second anchor means closer together.

37. (New) A sternal closure system as defined in claim 36, further comprising an apparatus for removing legs of said rigid fixing means from respective longitudinal passages of said first and second anchor means and separating the rigid fixing means from the first and second anchor means when necessary.